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# SCIENCE 24

## Module 2: Safety in Transit

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## **Science 24**

### **Module 2**

# **SAFETY IN TRANSIT**



**Distance  
Learning**

**Alberta**  
EDUCATION

Science 24  
Student Module  
Module 2  
Safety in Transit  
Alberta Distance Learning Centre  
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## Welcome to Module 2!

We hope you'll enjoy your study of Safety in Transit.

To make your learning a bit easier, a teacher will help guide you through the material.

So whenever you see this icon,



turn on your audiocassette and listen.



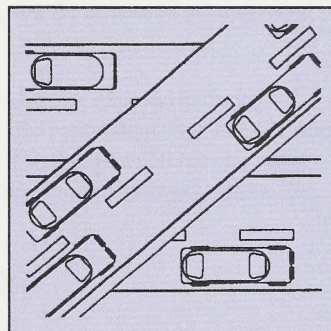


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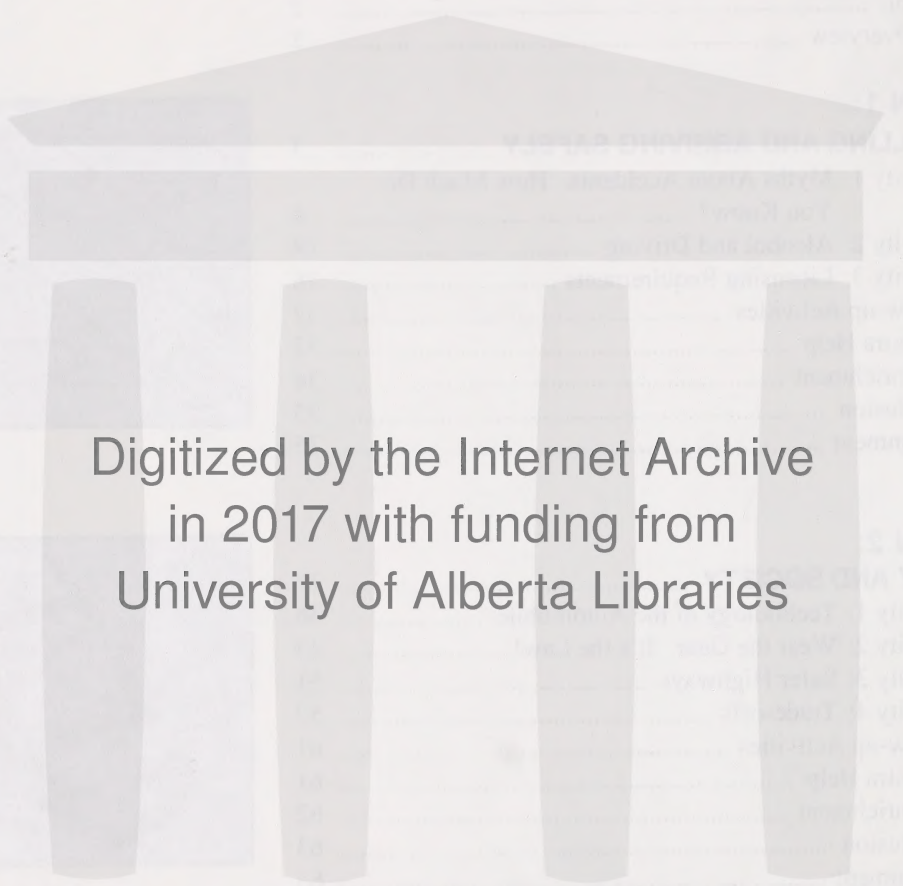
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## OVERVIEW

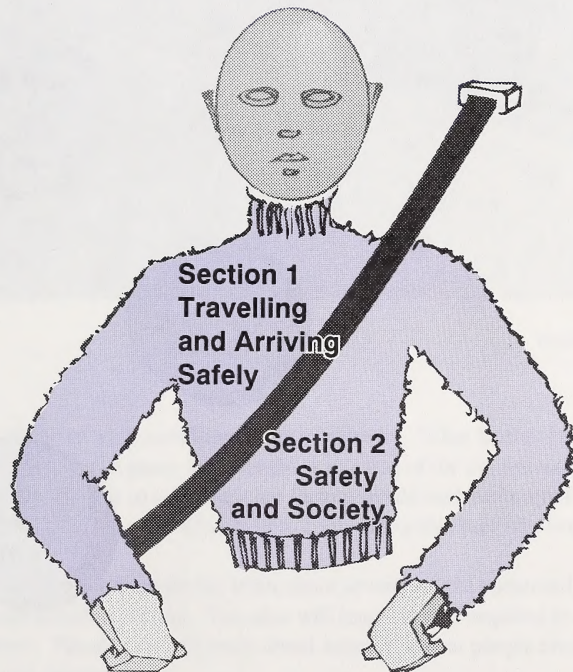
Do you remember the first time you ever sat behind a steering wheel? According to your learner's permit you were qualified to have this privilege. But were you aware of the risks and responsibilities that came with being a motorist?

Learning how to operate a vehicle and developing good driving skills are only a few steps towards travelling and arriving safely. Environmental conditions, vehicle technology, highway safety standards, and the actions of other drivers also contribute to transportation safety.

In this module you will learn about the risks people are exposed to during transport from one place to another. You will also learn about technology's role in the safety and practicality of transportation. Finally, you will become more aware of your responsibilities towards your safety and the safety of others.

### Module 2

#### Safety in Transit



## Evaluation

Your mark in this module will be determined by your work in the assignment booklet. You must complete all assignments. In this module you are expected to complete two section assignments. The mark distribution is as follows:

Section 1 Assignment	47 marks
Section 2 Assignment	53 marks
<hr/>	
TOTAL	100 marks

## Course Overview

Module 1  
Dynamics  
of Motion

Module 2  
Safety in  
Transit

Module 3  
Exposing  
Disease

Module 4  
Disease  
Defenses

Module 5  
Exploring  
Metals

Module 6  
Exploring  
Nonmetals

Module 7  
Energy  
Forms

Module 8  
Energy in  
Action



## 1

# Travelling and Arriving Safely



WESTFILE INC.

Look at this photo of a car travelling down a highway. What factors would you need to know in order to guess whether the occupants of the car are travelling and arriving safely? Try to imagine what factors would make this a risk-free scenario. Then try to imagine what factors could make this scenario very risky.



In this section you will discover the truth about several myths commonly believed about travelling safely. You also will learn what is required to have a driver's license. Finally you will learn about some risks that people create, such as drinking and driving.

## Activity 1: Myths About Accidents: How Much Do You Know?



Driving a car is not the only method of transportation, nor are safety considerations restricted to this mode of travel. Other examples of travel modes that also bring about safety concerns include motorcycles, bicycles, trains, planes, boats, snowmobiles, pedestrians, trucks, and buses.

In this activity you will investigate some of the personal risks involved while travelling today's roadways.

### Self-test About Accidents

The following is a self-test in a true-false format. Place a **T** in the blank if you think that the statement is true. If you think that the statement is false, place an **F** in the blank. If the statement is false, re-write the statement making it true.

- \_\_\_\_\_ 1. On average, one person dies each day on Alberta roadways because of traffic accidents.

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- \_\_\_\_\_ 2. Your chances of surviving a collision improve if you are thrown out of the vehicle.

---

---

**fatality** – the death of a person within 30 days of a motor vehicle collision

- \_\_\_\_\_ 3. The **fatality** rate of motorcycle accidents is less than that of cars.

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- \_\_\_\_\_ 4. A large number of people who are belted into their cars are killed in a burning or submerged car.

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- \_\_\_\_\_ 5. If you don't have a child restraint seat, you should place the child in your seat belt with you.
- \_\_\_\_\_ 6. You can react fast enough during an accident to brace yourself in the car seat.
- \_\_\_\_\_ 7. Most people die in traffic accidents during long trips.
- \_\_\_\_\_ 8. A person not wearing a seat belt in your car poses a hazard to you.
- \_\_\_\_\_ 9. Traffic accidents occur most often on Monday mornings.
- \_\_\_\_\_ 10. Male drivers between the ages of 16 and 19 years are most likely to be involved in traffic accidents.
- \_\_\_\_\_ 11. **Casualty collisions** are most frequent during the winter months.

---

**casualty collision** – a vehicle collision which results in death or injury

---

- \_\_\_\_\_ 12. More pedestrians than drivers are killed by cars.
- \_\_\_\_\_ 13. The greatest number of roadway fatalities can be attributed to poor driving conditions.
- \_\_\_\_\_ 14. The greatest number of female drivers involved in traffic accidents are between the ages of 16 and 20 years.
- \_\_\_\_\_ 15. Unrestrained occupant casualties are more likely to be young adults between the ages of 16 and 19.

Check your answers by turning to the Appendix, Section 1: Activity 1.

### What Was Your Score?

You might want to match your score with the following description.

Give yourself two points for a correct answer and subtract one point for an incorrect answer.

**21 – 30 points:** Expert analyst – You have a very good understanding of the risks involved in the day-to-day travel.

**14 – 20 points:** Good analyst – You have a good understanding of the risks involved in day-to-day travel. There are a few things that may surprise you when you study some of these risks further.



**9 – 13 points:** Novice analyst – You know why many accidents occur, but by the end of this section, you will know more about driving habits and what causes accidents.

**8 points or less:** A believer – You believe many of the myths created about day-to-day travel. By the end of this section you will know a great deal more about driving habits and what causes accidents.

### Interpreting the Data

From the self-test just completed, you may have learned some facts and statistics about accidents that were quite different from what you expected or imagined.

Based on your findings from the self-test, suggest two reasons for each of the statements that follow.

16. The highest number of fatalities in 1989 were recorded between July and August.

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17. Most traffic accidents occur on a Friday afternoon.

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18. Young drivers have a higher accident rate than other age groups.

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19. A person makes a long trip by car. On the return trip there is a greater chance of having an accident close to the person's place of residence than having an accident far from the place of residence.

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20. A higher accident rate is more likely to occur on ideal road conditions rather than on poor ones.

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Alberta Transportation, Statistics Canada, and National Safety Councils are some of the groups that monitor and record statistics on traffic accidents and fatalities.

21. Suggest four useful reasons for gathering, recording, and keeping accident statistics on file.

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In the next investigation you will analyse some statistical data related to traffic safety. These statistics may help to establish the truth about some of the accident myths covered in the previous investigation.

### **The Facts Behind the Answers**

In this investigation you will interpret selected data provided by the Alberta Traffic Collision Statistics 1990 report. The report is designed to show trends in driving habits and to outline some of the dangers for anyone travelling the roadways.

The information will be presented in graphs and charts. You will be asked to interpret the data and draw conclusions about the driving habits of people in Alberta.



Is the Death Rate on Alberta Highways Increasing?					
Alberta Traffic Collisions, 1986 – 1990					
Severity of Collision	1990	1989	1988	1987	1986
Fatal Collisions	357	408	395	425	430
Non-Fatal Injury Collisions	12619	13234	12728	13088	14383
Property Damage Only Collisions	106919	106722	97141	83980	82372
<b>Total Reportable Collisions</b>	<b>119895</b>	<b>120364</b>	<b>110264</b>	<b>97493</b>	<b>97185</b>
Number Killed	409	487	464	510	523
Number Injured	18604	19753	18777	19809	22148
<b>Total Number of Casualties</b>	<b>19013</b>	<b>20240</b>	<b>19241</b>	<b>20319</b>	<b>22671</b>

### Analysing the Data

22. a. Which year had the highest number of accidents?

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- b. In which year were the most people killed in traffic accidents?

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- c. Propose an explanation that indicates why the year with the greatest number of fatalities is not the year with the greatest number of accidents.

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<sup>1</sup> Statistics taken from *Alberta Traffic Collision Statistics 1990*. Reprinted with permission of the Alberta Transportation and Utilities, Motor Transport Services.

Who Were the Victims?						
Injuries and Fatalities by Road User Class, 1990						
Road User Class	Persons Killed		Persons Injured		Total Casualties	
	N	%	N	%	N	%
Drivers	201	49.1	10042	54.0	10243	53.9
Passengers	128	31.3	6026	32.4	6154	32.4
Pedestrians	45	11.0	1191	6.4	1236	6.5
Motorcyclists	15	3.7	670	3.6	685	3.6
Bicyclists	10	2.4	617	3.3	627	3.3
Unspecified	5	1.2	21	0.1	26	0.1
Other	5	1.2	37	0.2	42	0.2
<b>Total Casualties</b>	<b>409</b>	<b>100.0</b>	<b>18604</b>	<b>100.0</b>	<b>19013</b>	<b>100.0</b>

23. a. Which was the largest group of people killed in motor vehicle accidents?

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- b. The data seems to suggest that driving a motorcycle is safer than driving a car. Explain.

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- c. Would it be safe to assume that if all cyclists wore safety helmets the percentage of injured cyclists would fall in the next study?

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<sup>1</sup> Statistics taken from *Alberta Traffic Collision Statistics 1990*. Reprinted with permission of the Alberta Transportation and Utilities, Motor Transport Services.

What type of travel do you feel is more dangerous, car travel or motorcycle travel?

How Safe Are Motorcycles?							
Casualty Collisions Involving Motorcycles: Age and Sex of Motorcycle Driver 1990							
Age of Motorcycle Driver	Male		Female		Total*		Rate Per 1,000 Licensed Motorcycle Drivers**
	N	%	N	%	N	%	
Under 16	23	3.6	4	0.6	27	4.3	
16 – 17	39	6.1	–	–	39	6.1	88.8
18 – 19	87	13.7	–	–	89	14.0	55.0
20 – 24	154	24.3	7	1.1	163	25.7	13.6
25 – 34	183	28.8	9	1.4	193	30.4	3.2
35 – 44	86	13.5	2	0.3	88	13.9	1.7
45 – 54	21	3.3	3	0.5	24	3.8	1.5
55 – 64	4	0.6	–	–	4	0.6	0.5
65 and over	2	0.3	–	–	2	0.3	0.8
Unspecified	1	0.2	–	–	6	0.9	
Total Number of Motorcycle Drivers	600	94.5	25	3.9	635	100.0	

24. a. What groups of people are most likely to be involved in motorcycle casualty collisions?

<sup>1</sup> Statistics taken from *Alberta Traffic Collision Statistics 1990*. Reprinted with permission of the Alberta Transportation and Utilities, Motor Transport Services.



- b. What two groups of people are least likely to be involved in motorcycle casualty collisions?

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- c. If females and those people over the age of 55 have the lowest motorcycle casualty collisions, why is it not safe to assume that they are better motorcyclists than males or other age groups?

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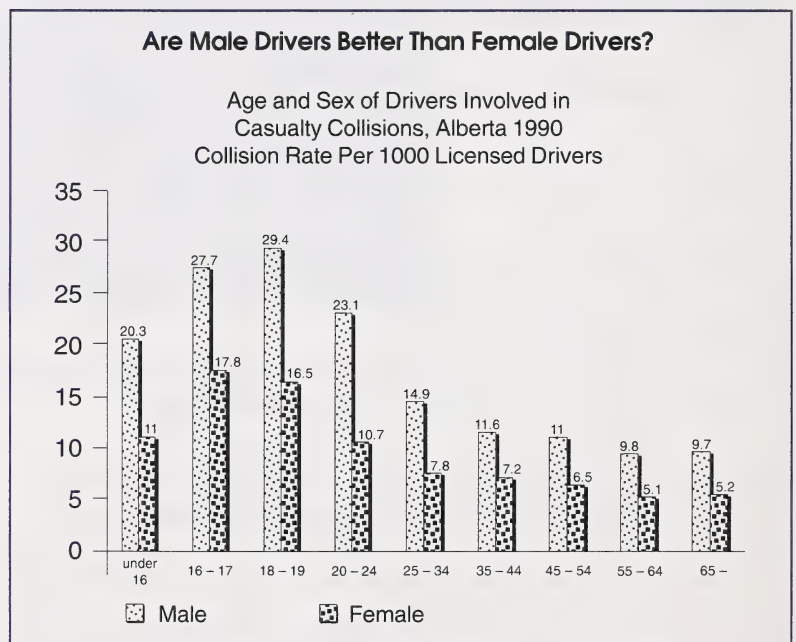
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25. a. Which sex group had fewer accidents?

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<sup>1</sup> Statistics taken from *Alberta Traffic Collision Statistics 1990*. Reprinted with permission of the Alberta Transportation and Utilities, Motor Transport Services.

- b. Provide a possible explanation for the difference.

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- c. If you were working for an insurance company, which age and sex group would you charge the highest rate? Why?

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- d. Suggest a possible explanation of why people between the ages of 16 to 21 years are the most likely to be involved in traffic accidents.

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What Day Do Collisions Occur?								
Collision Occurrence by Day of Week 1990								
Day of Week	Fatal Collisions		Non-Fatal Injury Collisions		Property Damage Only Collisions		Total Collisions	
	N	%	N	%	N	%	N	%
Monday	49	13.7	1686	13.4	15188	14.2	16923	14.1
Tuesday	45	12.6	1748	13.9	15285	14.3	17078	14.2
Wednesday	41	11.5	1666	13.2	15224	14.2	16931	14.1
Thursday	55	15.4	1812	14.4	15798	14.8	17665	14.7
Friday	56	15.7	2148	17.0	18516	17.3	20720	17.3
Saturday	65	18.2	1936	15.3	15289	14.3	17290	14.4
Sunday	46	12.9	1623	12.9	11619	10.9	13288	11.1
<b>Total Number of Collisions</b>	<b>357</b>	<b>100.0</b>	<b>12619</b>	<b>100.0</b>	<b>106919</b>	<b>100.0</b>	<b>119895</b>	<b>100.0</b>

<sup>1</sup> Statistics taken from *Alberta Traffic Collision Statistics 1990*. Reprinted with permission of the Alberta Transportation and Utilities, Motor Transport Services.

What Time Do Collisions Occur?								
Collision Occurrence by Time Period 1990								
Time Period	Fatal Collisions		Non-Fatal Injury Collisions		Property Damage Only Collisions		Total Collisions	
	N	%	N	%	N	%	N	%
11:00 p.m.- 2:59 a.m.	48	13.4	1183	9.4	8658	8.1	9889	8.2
3:00 a.m.- 6:59 a.m.	23	6.4	716	5.7	4459	4.2	5198	4.3
7:00 a.m.- 10:59 a.m.	64	17.9	1976	15.7	18421	17.2	20461	17.1
11:00 a.m.- 2:59 p.m.	60	16.8	2714	21.5	26291	24.6	29065	24.2
3:00 p.m.- 6:59 p.m.	87	24.4	3702	29.3	29897	28.0	33686	28.1
7:00 p.m.- 10:59 p.m.	71	19.9	2146	17.0	16664	15.6	18881	15.7
Unspecified	4	1.1	182	1.4	2529	2.4	2715	2.3
<b>Total Number of Collisions</b>	<b>357</b>	<b>100.0</b>	<b>12619</b>	<b>100.0</b>	<b>106919</b>	<b>100.0</b>	<b>119895</b>	<b>100.0</b>

26. a. On which day did the highest rate of collisions occur?

<sup>1</sup> Statistics taken from *Alberta Traffic Collision Statistics 1990*. Reprinted with permission of the Alberta Transportation and Utilities, Motor Transport Services.



- b. At what time of day was it most dangerous to be on the road?  
Suggest a possible explanation for this observation.

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What Road Conditions Affect Most Collisions?						
Casualty Collision Occurrence by Surface Condition 1990						
Surface Condition	Fatal Collisions		Non-Fatal Injury Collisions		Total Casualty Collisions	
	N	%	N	%	N	%
Dry	213	59.7	7161	56.7	7374	56.8
Snowy/Icy	70	19.6	2659	21.1	2729	21.0
Loose Material	35	9.8	720	5.7	755	5.8
Other	2	0.6	34	0.3	36	0.3
Unspecified	5	1.4	796	6.3	801	6.2
Total Number of Collisions	357	100.0	12619	100.0	12976	100.0

27. Can poor road conditions be blamed for the majority of accidents in Alberta? Explain.

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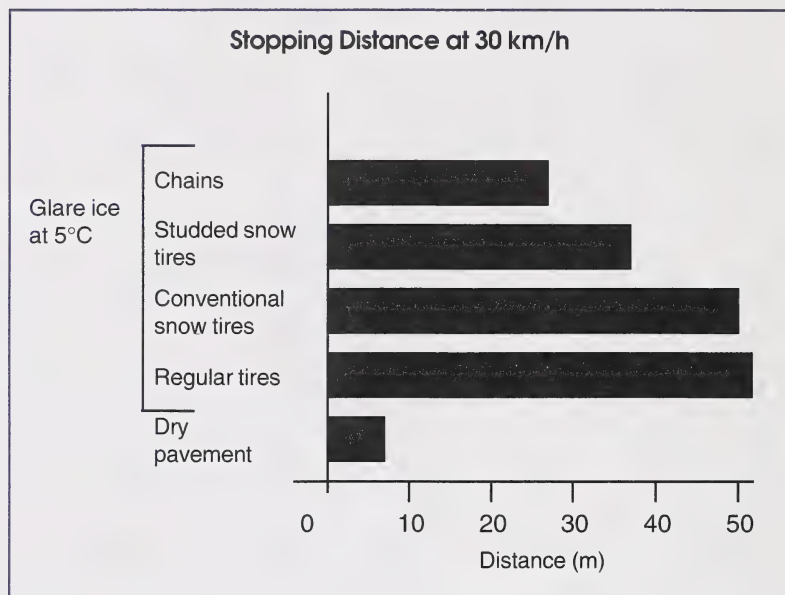
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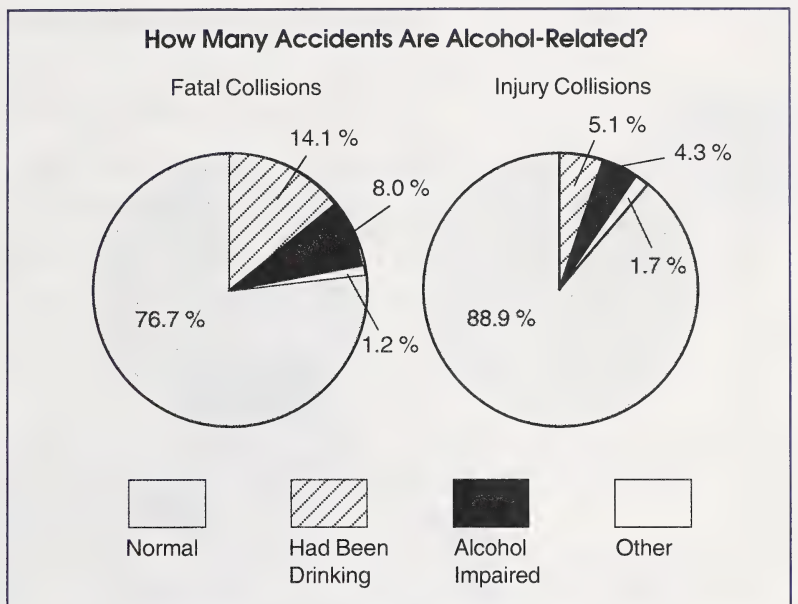
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<sup>1</sup> Statistics taken from *Alberta Traffic Collision Statistics 1990*. Reprinted with permission of the Alberta Transportation and Utilities, Motor Transport Services.

Even though a greater percentage of fatal collisions occur on dry roads, snow and ice-covered roads are a definite hazard. Every year the first snowfall in Alberta is a treacherous time of the year. Drivers must slow down and be prepared to extend stopping distances. The following graph compares stopping distances on various surfaces.



The previous graph shows that stopping distances at 30 km/h increases as much as ten times on glare ice over dry pavement. This is the fact that makes the first snowfall so dangerous. Roads covered with snow and ice are only one example of something that increases stopping distances. Wet road surfaces will have similar results.



28. The statistics indicate that an alcohol-related injury tends to be more serious. Propose a possible explanation for this fact.

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Check your answers by turning to the Appendix, Section 1: Activity 1.

<sup>1</sup> Statistics taken from *Alberta Traffic Collision Statistics 1990*. Reprinted with permission of the Alberta Transportation and Utilities, Motor Transport Services.



## Activity 2: Alcohol and Driving



### Did You Know?

No one is immune to accidents. During your lifetime, you have a fifty-fifty chance of being injured in a car accident. Regardless of how good a driver you may be, you could always be hit by another driver. You may even be hit by a drunk driver.



EDMONTON POLICE SERVICE

Driving while impaired by alcohol is not only illegal, it is very dangerous. A person's judgement, vision, and reaction time can be affected by alcohol. When a person is affected by alcohol, the tendency to make mistakes is greater. This activity will explain what drunk drivers are and show just how dangerous they are.

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**drug** – any substance that affects the body's normal function

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**psychoactive** – affecting the mind

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**depressant** – a drug that slows down the body's functions

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## What Is Alcohol?

Alcohol is a **drug** commonly found in beer, wine, and spirits.

The type of alcohol that people drink is ethyl alcohol. There are other types of alcohol which are poisonous. Alcohol is a **psychoactive** drug because of its effect on the mind. As a drug, alcohol is classified as a **depressant**. This means that alcohol slows down the body's functions. For example, drunk drivers don't have the necessary reflexes or ability to make quick decisions. Their impaired driving perception, judgement, and coordination skills become a dangerous risk to others.

## Some Effects of Alcohol

Alcohol alone is not the only factor that creates problems. The mood of a person and their emotional state before drinking could also affect the outcome of alcohol consumption.

For example, if you were happy or sad, alcohol will generally intensify the feelings. If your state of health is not up to par, such as when you have a cold, alcohol may have a greater effect on you than it would on a healthy person.

Regardless of the type of drink consumed, the effect is generally the same. Types of drinks can be compared in the following way, where **1 drink equals**

- 43 mL of rum, rye, scotch, gin, brandy, vodka
- 341 mL of normal strength beer
- 83 mL of fortified wine
- 142 mL of table wine

## Your Body and Alcohol

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**BAC** – Blood Alcohol Concentration measured as the number of milligrams of alcohol in 100 millilitres of blood

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In Canada, the amount of alcohol in a person's blood is generally described as the Blood Alcohol Concentration or **BAC**. It is measured as the number of milligrams of alcohol for every 100 millilitres of blood. The legal limit is 80 mg of alcohol in 100 mL of blood, or 80 mg%. This is usually expressed as 0.08. A legally impaired driver exceeds 0.08. You can convert mg% into a decimal by dividing by 1000.

The following table indicates the estimated BAC in mg% for males and females by the number of drinks in relation to body weight. No consideration is given for physical factors such as the amount of food and sleep the person has had or the rate of drinking.

mg% Based on Number of Drinks													
Females							Males						
Body Weight (kg)	No. of drinks						No. of drinks						
	1	2	3	4	5	6	1	2	3	4	5	6	
45	50	101	152	203	253	304	43	87	130	174	217	261	
57	40	80	120	162	202	244	34	69	103	139	173	209	
68	34	68	101	135	169	203	29	58	87	116	145	174	
79	29	58	87	117	146	175	25	50	75	100	125	150	
91	26	50	76	101	126	152	22	43	65	87	108	130	
102	22	45	68	91	113	136	19	39	58	78	97	117	
114	20	41	61	82	101	122	17	35	52	70	87	105	

To determine the BAC, the number of hours since the first drink must also be taken into consideration. In addition, the following adjustments would also need to be made:

<b>Hours since first drink</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Subtract from BAC</b>	<b>15</b>	<b>30</b>	<b>45</b>	<b>60</b>	<b>75</b>

<sup>1</sup> Statistics taken from Road Safety and Motor Vehicle Regulation. *Smashed*. Reprinted with the permission of Minister of Supply and Services Canada, 1987.



1. a. What is the BAC for a female if she weighs 45 kg and has had four beer over a 3-hour period of time?

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- b. How long will it take before the alcohol is completely eliminated from her body?

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- c. How long will she have to wait before she is legally able to drive with a BAC reading less than 80 mg% or 0.08?

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2. a. A male student weighing 79 kg had a beer and two rum and colas while watching a football game for two hours. On his way home he was pulled over in a Checkstop. Will he be charged with impaired driving? Explain.

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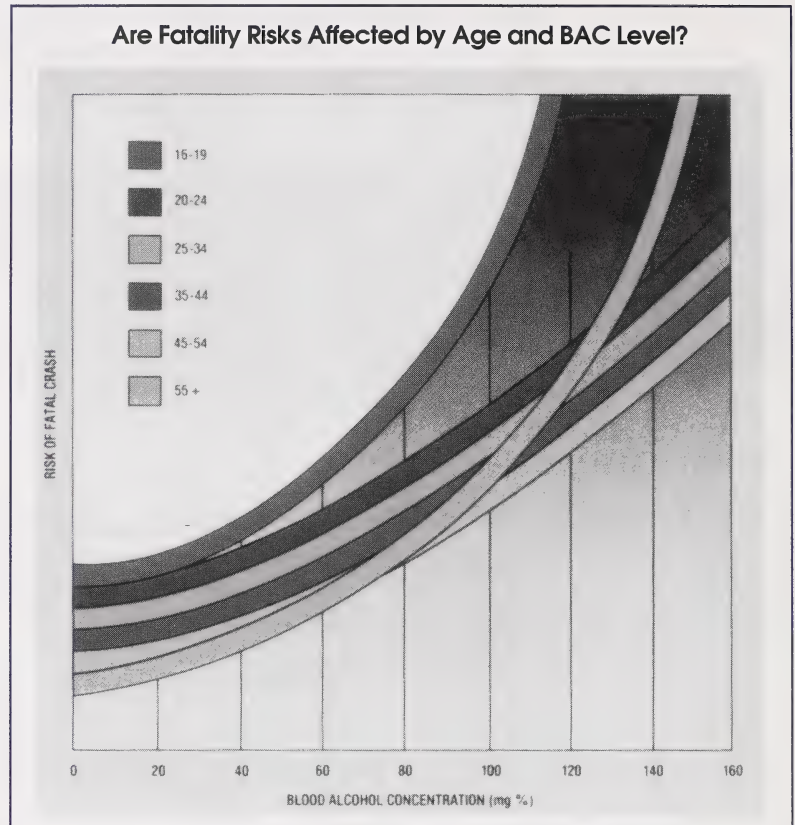
- b. How long will it take before the alcohol is eliminated from his body?

---

3. What is the length of time and the number of drinks it would take for you to become legally impaired?

---

The following graph indicates the risk of having a fatal crash in relation to age and BAC.



4. If you are 19 years old and have a BAC of 80 mg%, is your amount of risk higher or lower compared to someone 25 years old with a BAC of 80 mg%? Explain.

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<sup>1</sup> Taken from Road Safety and Motor Vehicle Regulation, *Smashed*. Reprinted with the permission of Minister of Supply and Services Canada, 1987.

5. Suggest two reasons why the risk is so high for people aged 16 to 19 years of age.

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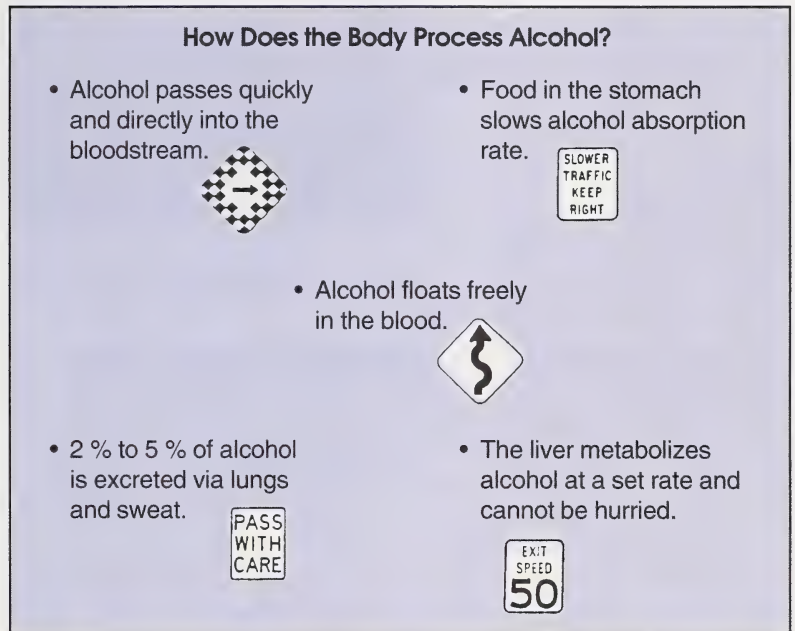
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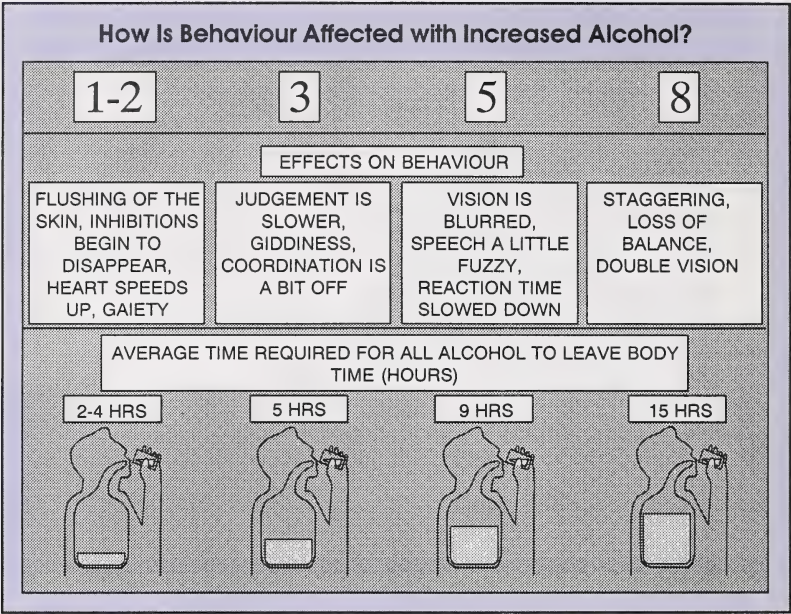
### How the Body Processes Alcohol



AADAC



The following chart shows the effects of increasing amounts of alcohol on the behaviour of a 73 kg male.



6. a. How does drinking affect the person’s vision?

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b. How does this then affect the person’s ability to drive?

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<sup>1</sup> Taken from *Smashed – The Magazine on Drinking and Driving*. Reprinted with the permission of Transport Canada.

7. Explain why a slowing down of reflexes or reaction time increases the danger level of driving a motor vehicle.

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Having a BAC above 80 mg% is not only dangerous, it is against the law. Under the Criminal Code of Canada, section 237, a person could face a jail term as well as a fine. The following table illustrates the minimum and maximum penalties for impaired driving in Canada.

What Are the Penalties for Impaired Driving?	
The <i>minimum</i> penalties for impaired-driving offences are:	
First conviction	a \$300 fine and a prohibition from driving for three months.
Second conviction	14 days in jail and a prohibition from driving for six months.
Third or later conviction	90 days in jail and a prohibition from driving for one year.
The <i>maximum</i> penalties are:	
For impaired driving, boating or flying: for operating a motor vehicle, vessel or aircraft with a BAC over 80 mg%; for refusing to give a breath or blood sample; for having care or control while impaired or with a BAC over 80 mg%.	Five years in prison and a prohibition from driving for three years.
For dangerous operation of a motor vehicle, vessel or aircraft.	Five years in prison and a prohibition from driving for three years.
For impaired driving, boating or flying causing bodily harm; for dangerous operation causing bodily harm; for criminal negligence causing bodily harm.	10 years in prison and a prohibition from driving for 10 years.
For impaired driving, boating or flying causing death; for dangerous operation causing death.	14 years in prison and a prohibition from driving for 10 years.
For manslaughter and for criminal negligence causing death.	Life in prison and a lifetime prohibition from driving.

<sup>1</sup> Taken from *Smashed – The Magazine on Drinking and Driving*. Reprinted with the permission of Transport Canada.

8. Do you think that the minimum penalties for impaired driving offences are too lenient or too severe? Explain your answer.

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Check your answers by turning to the Appendix, Section 1: Activity 3.

### Activity 3: Licensing Requirements



With all of the different types of vehicles on roadways, it would not make sense to assume that one operator's licence would apply to all of these vehicles.

There are many different classes of licences all having different requirements. This is necessary for society to help make decisions regarding safe transportation.

#### Classes Of Alberta Driver's Licences

There are seven classes of licences in Alberta that allow operators different rights and obligations, which are outlined in the following figures. This information will be used to answer the questions that follow.



### Class 7 Licence

Permits an operator to drive:

- a moped;
- a motor vehicle referred to in the Class 5 category, as a learner; and
- a motorcycle, as a learner, if the operator is at least 16 years of age.

Minimum learning or licensing age – 14 years.



### Class 6 Licence

Permits an operator to drive:

- a motorcycle or a moped; and
- all motor vehicles under Class 5, for learning only.

Vehicle for road test:

- motorcycle without sidecar.

Minimum learning or licensing age – 16 years.



<sup>1,2</sup> Taken from *Driver Basic Licence Information 1990*. Reprinted with permission of the Motor Vehicles Division, Department of the Solicitor General.

### Class 5 Licence

Permits an operator to drive:

- a two axle single motor vehicle, excluding a motorcycle;
- a two axle motor vehicle towing a trailer with one or more axles, if the trailer is not equipped with airbrakes;
- a recreational vehicle or any combination of a recreational vehicle and a trailer, if the trailer has not more than two axles and is not equipped with airbrakes;
- a moped; and
- Classes 1, 2, 3, 4 and 6 type vehicles, for learning only.

No holder of a Class 5 operator's licence shall operate a motor vehicle:

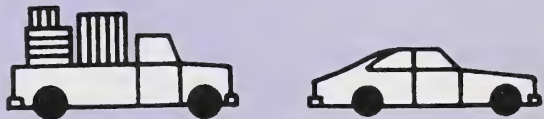
- that has a seating capacity of more than 15, while that vehicle is transporting any person other than the operator, or
- to transport for hire.

Vehicles for road test:

- any two axle motor vehicle excluding a motorcycle.

Minimum learning age – 14 years.

Minimum licensing age – 16 years.



### Class 4 Licence

Permits an operator to drive:

- a taxi, ambulance or bus (including school or kindergarten buses) where seating capacity is not over 24, excluding the operator;
- all motor vehicles included under Class 5; and
- all motor vehicles included under Classes 1, 2, 3 and 6, for learning only;

Vehicle for road test:

- any two axle motor vehicle excluding a motorcycle.

Minimum learning or licensing age – 18 years.



<sup>1,2</sup> Taken from *Driver Basic Licence Information 1990*. Reprinted with permission of the Motor Vehicles Division, Department of the Solicitor General.

### Class 3 Licence

Permits an operator to drive:

- any motor vehicle, or combination of vehicles that the holder of a Class 5 operator's licence may operate;
- a single motor vehicle with three or more axles;
- a motor vehicle with three or more axles towing a trailer with one or more axles, if the trailer is not equipped with airbrakes;
- Classes 2 and 4 type vehicles without passengers; and
- all motor vehicles included under Class 1, 2 and 6, for learning only.

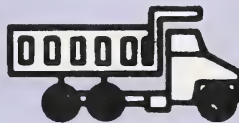
No holder of a Class 3 operator's licence shall operate a motor vehicle:

- that has a seating capacity of more than 15, while that vehicle is transporting any person other than the operator, or
- to transport passengers for hire.

Vehicle for road test:

- any single motor vehicle having three or more axles.

Minimum learning or licensing age – 18 years.



### Class 2 Licence

Permits an operator to drive:

- any motor vehicle, or combination of vehicles, that the holder of a Class 3, 4 and 5 operator's licence may operate;
- any bus; and
- Classes 1 and 6 type vehicles, for learning only.

Vehicle for road test:

- a bus with a seating capacity exceeding 24 excluding the operator.

Minimum learning or licensing age – 18 years.



<sup>1,2</sup> Taken from *Driver Basic Licence Information 1990*. Reprinted with permission of the Motor Vehicles Division, Department of the Solicitor General.



### Class 1 Licence

Permits an operator to drive:

- any motor vehicle, or combination of vehicles, other than a motorcycle; and
- Class 6 type vehicles, for learning only.

Vehicle for road test:

- Tractor-Trailer combination with three or more axles and equipped with airbrakes.

Minimum learning or licensing age – 18 years.



A medical examination is required for Classes 1, 2, and 4, as well as on initial application for Classes 3, 5, 6, and 7.

1. Answer the following true/false questions. Place a **T** if the statement is true and an **F** if the statement is false. If the statement is false, rewrite it to make it true.

\_\_\_\_\_ a. A Class 5 and a Class 7 licence require a medical examination.

\_\_\_\_\_

\_\_\_\_\_ b. A Class 4 licence is required to operate a two-axle vehicle and trailer not equipped with air brakes.

\_\_\_\_\_

\_\_\_\_\_ c. A Class 5 licence permits a person to operate a city transit bus.

\_\_\_\_\_

<sup>1</sup> Taken from *Driver Basic Licence Information 1990*. Reprinted with permission of the Motor Vehicles Division, Department of the Solicitor General.

- \_\_\_\_\_ d. A taxi or ambulance driver needs a Class 3 licence.  
\_\_\_\_\_
- \_\_\_\_\_ e. A Class 6 licence is required to operate a moped or motorcycle.  
\_\_\_\_\_
- \_\_\_\_\_ f. A Class 2 licence requires the driver to own and wear a helmet.  
\_\_\_\_\_
- \_\_\_\_\_ g. A Class 4 licence permits the driver to operate a pick-up truck.  
\_\_\_\_\_
- \_\_\_\_\_ h. A Class 2 licence permits a person to operate a bus with less than twenty-four passengers.  
\_\_\_\_\_
- \_\_\_\_\_ i. A Class 7 licence permits a person to operate a school bus.  
\_\_\_\_\_
- \_\_\_\_\_ j. For a 16 year old to operate a car independently, a Class 6 licence is required.  
\_\_\_\_\_

2. What minimum class of licence in Alberta is required to do the following?
- a. learn to drive a car \_\_\_\_\_
  - b. drive a car unaccompanied \_\_\_\_\_
  - c. operate a farm tractor \_\_\_\_\_
  - d. drive a recreation vehicle \_\_\_\_\_

e. drive all vehicles other than motorcycle \_\_\_\_\_

f. operate a kindergarten bus \_\_\_\_\_

3. Suggest why medical examinations are required for Classes 1, 2, and 4 licences.

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4. What medical testing is required before a learner's permit is issued?

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Check your answers by turning to the Appendix, Section 2: Activity 3.

## Follow-up Activities



If you had some difficulty understanding the concepts and the activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

### Extra Help

When travelling in an automobile, the condition and expertise of the driver is an important safety consideration. However, road conditions and actions of other people, such as impaired drivers, pedestrians, and cyclists, are also a contributing factor to safe transportation.

The consumption of alcohol increases the risk of injury in a car accident. Impaired driving is a criminal offence punishable under the Criminal Code of Canada.

Place a **T** beside the statement if it is true and an **F** if it is false. If the statement is false, rewrite the statement to make it true. If you have any difficulties, go back to the section to help you with your decision.

- \_\_\_\_\_

1. Your chances of surviving a collision are better if you are thrown clear.

\_\_\_\_\_
- \_\_\_\_\_

2. The fatality rate of motorcycle accidents is less than that of cars.

\_\_\_\_\_
- \_\_\_\_\_

3. Being a passenger in a car is safer than being a driver.

\_\_\_\_\_
- \_\_\_\_\_

4. Male drivers have a lower collision rate than female drivers.

\_\_\_\_\_
- \_\_\_\_\_

5. Sunday is the safest day to travel.

\_\_\_\_\_
- \_\_\_\_\_

6. A very dangerous time to travel is at 5:00 p.m.

\_\_\_\_\_
- \_\_\_\_\_

7. Poor weather can be blamed for a majority of the accidents in Alberta.

\_\_\_\_\_
- \_\_\_\_\_

8. Seat belts don't improve safety.

\_\_\_\_\_



- \_\_\_\_\_ 9. Alcohol speeds up brain activity.
- \_\_\_\_\_ 10. A first conviction for impaired driving can bring a minimum fine of \$2000.00.

Check your answers by turning to the Appendix, Section 1: Extra Help.

### Enrichment

Do **one** of the following:

1. Prepare a report on drinking and driving. Contact your local library, police department, or use information from AADAC's *Drive Alive* Resource Kit in your school for current information.
2. Survey a group of people about seat belts. Make up a list of arguments for and against seat belts and question them as to whether they agree or disagree. Think of ways in which you could change people's attitudes about wearing seat belts.
3. Using information from *Alberta Traffic Collision Statistics*, or other resources, write a report about motorcycle accident statistics. Your report should also include statistics comparing using a helmet versus not using a helmet.

Check your answers by turning to the Appendix, Section 1: Enrichment.

## Conclusion

You should have discovered some facts about travelling on the road and arriving safely. Different modes of travel involve different levels of transportation risk to people. Sometimes the cost or comfort of safety features forces technology to trade off a better safety device for something more workable.

Drinking alcohol and driving greatly increases the risk of being injured or causing injury while travelling the roadways.

A small icon of a booklet with the text "Assignment Booklet" inside.

Assignment  
Booklet

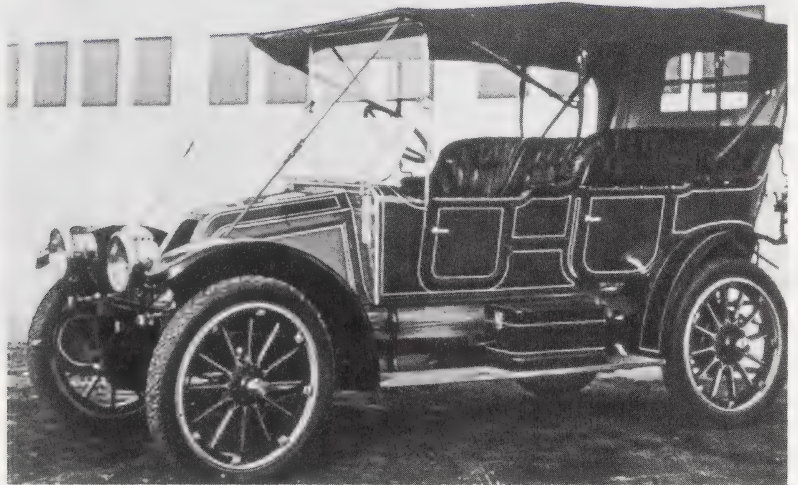
### ASSIGNMENT

Turn to your Assignment Booklet and do the assignment for Section 1.



## 2

# Safety and Society



Have you ever thought about what it would have been like to travel in the days when the automobile was relatively new? Can you imagine the kind of safety features the car had? What do you think the roads were like?

In this section you will learn about how the automobile has advanced in terms of safety features. Comfort and economy have also been incorporated with safety features. You will learn about one particular safety feature – the seat belt. You will also discover how roads have been adapted to become safer.

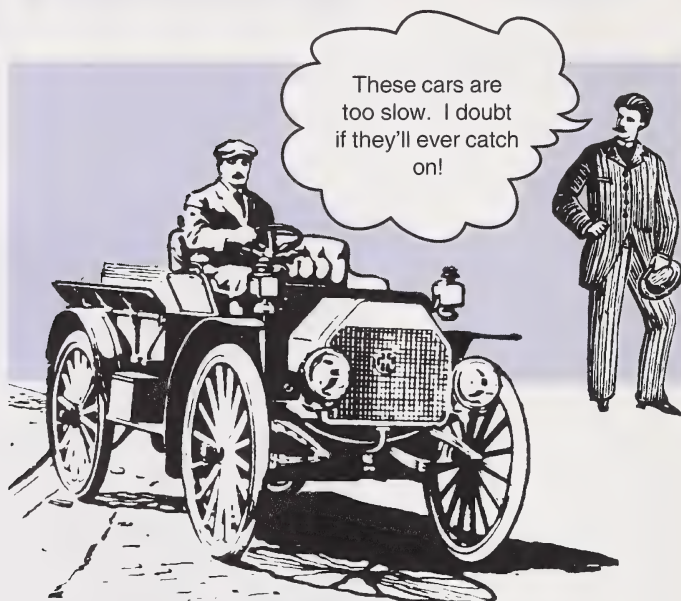






## Activity 1: Technology of the Automobile

When the automobile first came on the scene, speeds were slow and the car often broke down or got stuck in muddy wagon trails serving as roadways. Early automobile travel was not much faster than a leisurely walk. Quite often walking and driving five kilometres would take the same amount of time.



Due to the low speeds and fewer cars in the early 1900s, deaths from traffic accidents then were not as common as they are today.

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**technology** – all the inventions and techniques people have developed to solve practical problems; science at work

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As **technology** advanced, the cars developed into faster and more comfortable machines. More people wanted them, and the number of cars on the roadways grew.

The need and demand for larger and improved highways also grew and continues to grow. With increased number of vehicles and increased speed on roadways, serious traffic accidents became more common.

Many safety features are found on some cars today, but 25 years ago this technology was only in the developmental stage.

Through extensive testing and experimentation, technology and science have provided a wide choice of safety features. When a person buys a car there is a variety of safety options to purchase, but as with anything new, technology costs money.

- 1. Suggest why cars became popular in such large numbers and as rapidly as they did?

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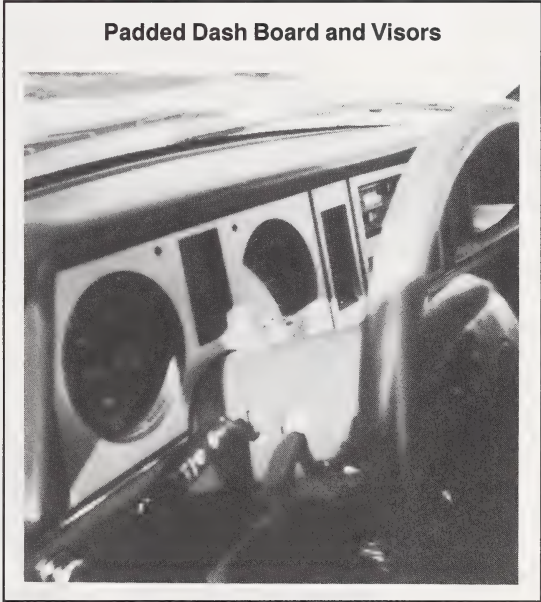
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Some of the safety features that have been developed in cars to try to reduce the number of collision fatalities are illustrated in the following figures.

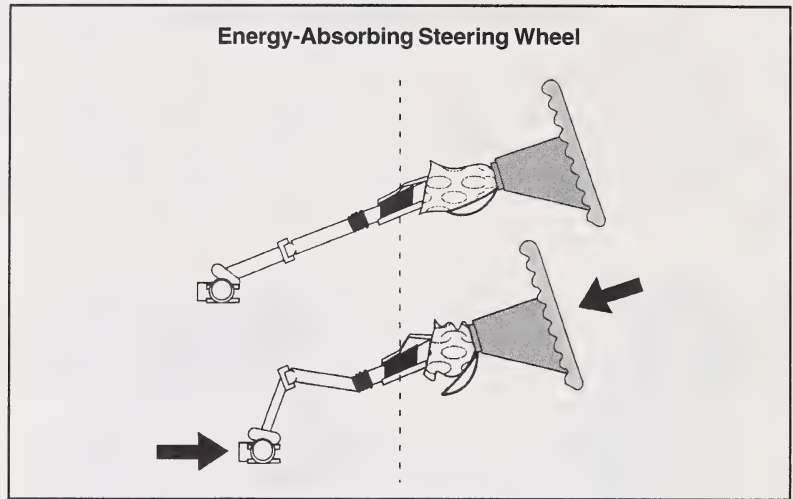
- 2. For each of the following safety features, state how this technology reduces injuries or fatalities during collision.



- a. padded dash board and sun visors

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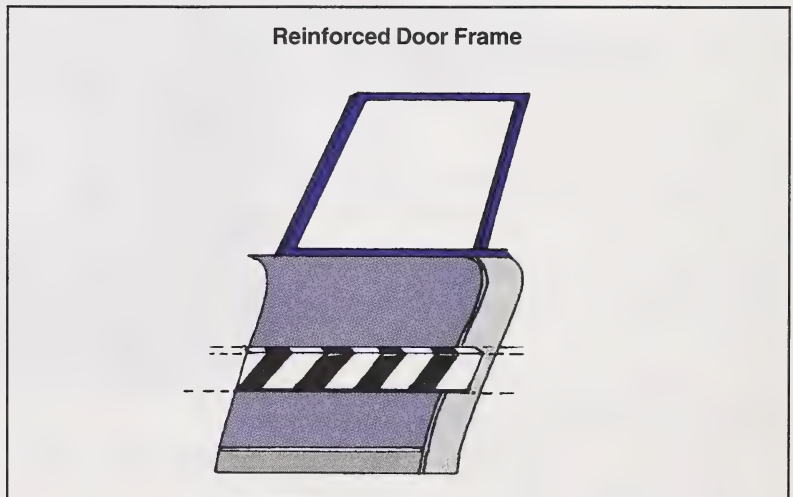


b. energy-absorbing steering column

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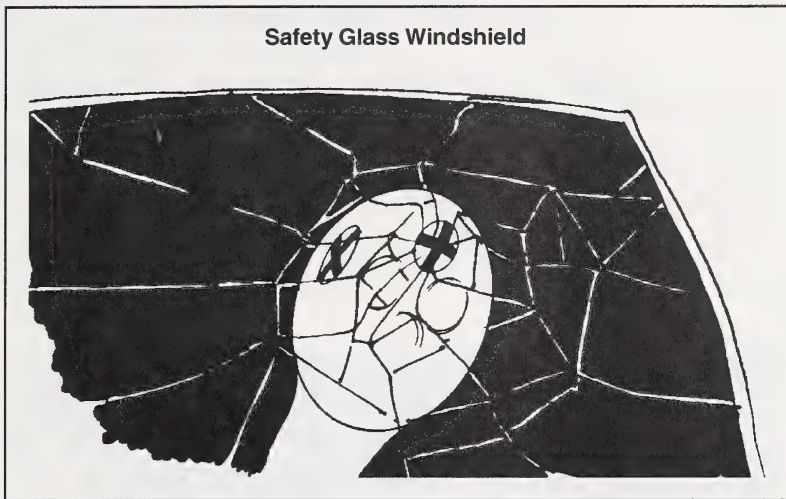


c. reinforced door frame

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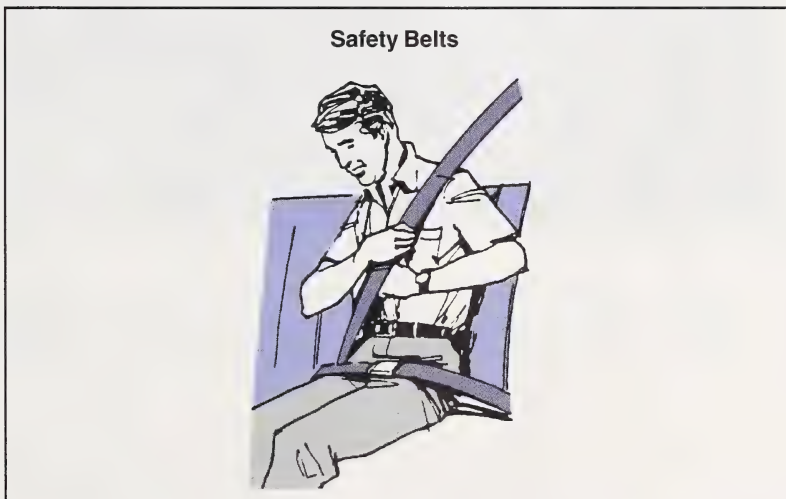
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d. safety glass windshields

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e. safety belts

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3. Design your own car that would be as safe as possible. Draw a diagram and point out at least six important safety features of your car. Also state the function of each piece of safety equipment. You may want to look at some of the automotive magazines available in your library for new technologies.

Check your answers by turning to the Appendix, Section 2: Activity 1.

## Activity 2: Wear the Gear. It's the Law!



To avoid the safety risks, travellers must wear the gear. The safety gear available to be worn by the driver and passengers in cars is the seat belt and harness.

People who drive race cars sometimes have collisions at very high speeds. The amazing thing about these collisions is the lack of serious injuries resulting from them. This is primarily due to the intricate seat belts designed to reduce the second collision.



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**restraint device** – a system such as seat belts designed to hold a person in place during collision

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The type of system shown in the photo is commonly referred to as a **restraint device**. Its purpose is to reduce serious and fatal injuries sustained in traffic collisions. Its use became mandatory in some countries as early as the 1970s.

Research has shown that properly adjusted restraints will reduce serious and fatal injuries by 60 to 80 percent.

The following results have been obtained in some areas that introduced mandatory seat belt use:

- Australia required the use of seat belts since 1970. They have achieved more than a 20 percent drop in deaths.
  - Sweden recorded 84 percent belt use with a 46 percent reduction in serious injuries from collision.
  - Belgium recorded a 53.8 percent drop in deaths and a 28 percent drop in severe injuries during the first four months of mandatory seat belt use.
  - Ontario recorded 21 percent fewer deaths than the number predicted on the basis of a 10 year fatality record during the first six months in 1976 when it required seat belt use.
  - Alberta recorded a decrease in severity of injuries as seat belt use increased each year since seat belt use became law. For approximately eleven months in 1989 when the seat belt law was not enforced, 73.1 percent of the fatally injured occupants were not restrained at the time of the crash.
1. Suggest three reasons why all car occupants should be encouraged to use restraining devices.

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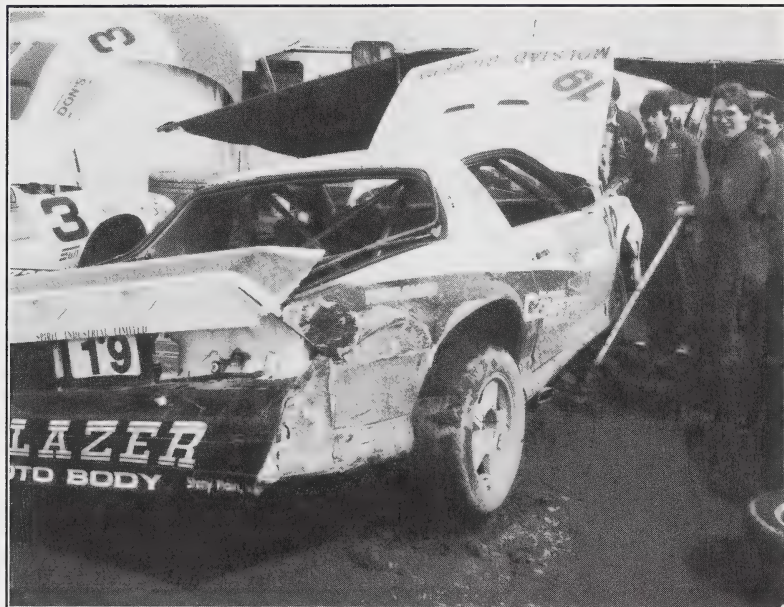
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### Why Do Racing Car Drivers Survive Most Collisions?



The previous photo shows a racing car after it skidded off the track and hit a concrete wall at approximately 140 km/h. The driver walked away without major injury. Why?

The type of restraint system used by racing car drivers is not very practical for everyday use. Therefore, technology must modify such a system to provide comfort and convenience and to also keep the costs down for ordinary car drivers and passengers.



### Why Do Young Children Require Special Restraints?



The conventional lap and shoulder belts worn by adults allow some freedom of movement under normal conditions. However, they are designed to lock a person securely in place during a collision.

Since the bodies of infants and young children are different from adult bodies, special restraints have been developed, as illustrated in the diagram, to provide the same degree of protection that adults receive when they wear the gear.

2. Restraints are sometimes used to belt in an adult and an infant held on the adult's lap. Explain the danger in using this method of restraint.

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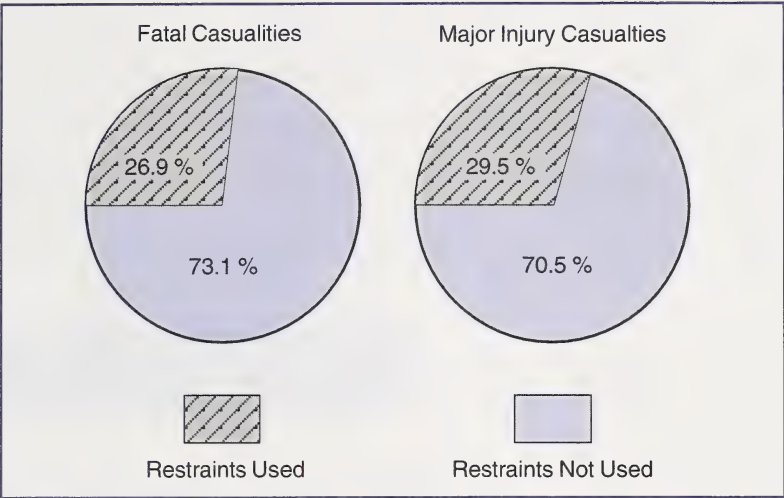
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<sup>1</sup> Taken from Transport Canada and the Ontario Ministry of Transportation and Communications, *The Human Collision*, 1976. Reproduced with the permission of the Minister of Supply and Services Canada, 1992.

Do Seat Belts Really Help?



Analysing the Data

3. a. Do seat belts really make a difference? Give a reason for your answer.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

<sup>1</sup> Statistics taken from *Alberta Traffic Collision Statistics 1990*. Reprinted with permission of the Alberta Transportation and Utilities, Motor Transport Services.

- b. The largest group not wearing seat belts in Alberta is people between the ages of 16 and 19. Why is this such an alarming statistic?

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Check your answers by turning to the Appendix, Section 2: Activity 1.

### Did You Know?

From February to December of 1989, the Alberta seat belt law was not enforced. During that time, 73.1 percent of the occupant casualties who sustained a fatal injury were not using restraints at the time of the crash.

### Arguments Against Seat Belts

You will be given some common arguments people use for not wearing seat belts.

4. Read the following arguments, and respond either in favour or against the given argument. Give a reason for your answer.
- a. Seat belts can trap you. It's better to be thrown free in a collision.

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- b. I don't need a seat belt. In case of a collision, I can brace myself with my hands.

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- c. I just don't believe that I will get in an accident.

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- d. Seat belts don't prevent injuries; they cause them.

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- e. I am a good driver and I have excellent reactions, so I don't need seat belts.

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- f. If I wear a seat belt, I might be trapped in a burning or submerged car.

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- g. When I wear my seat belt, I can lean forward and touch my head to the windshield. How can wearing this belt save my life?

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- h. I only need to wear seat belts on long trips or while driving at high speeds.

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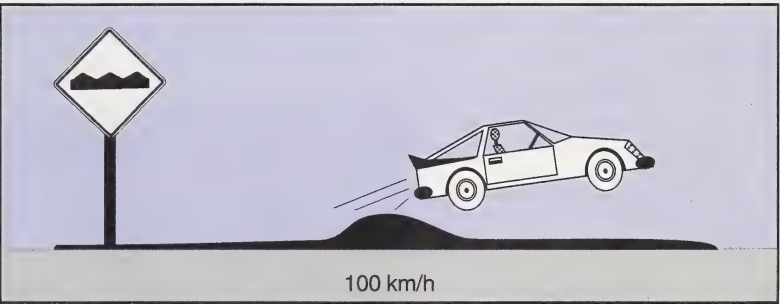
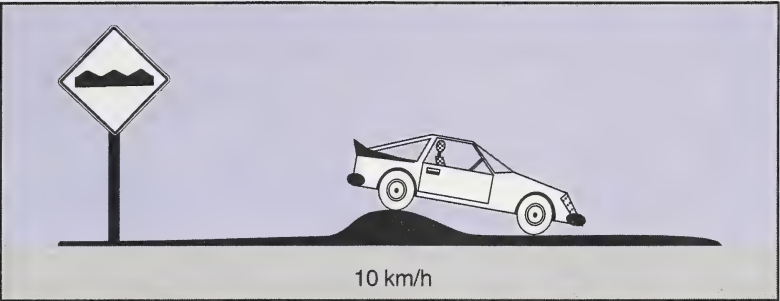
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Check your answers by turning to the Appendix, Section 1: Activity 2.

Activity 3: Safer Highways

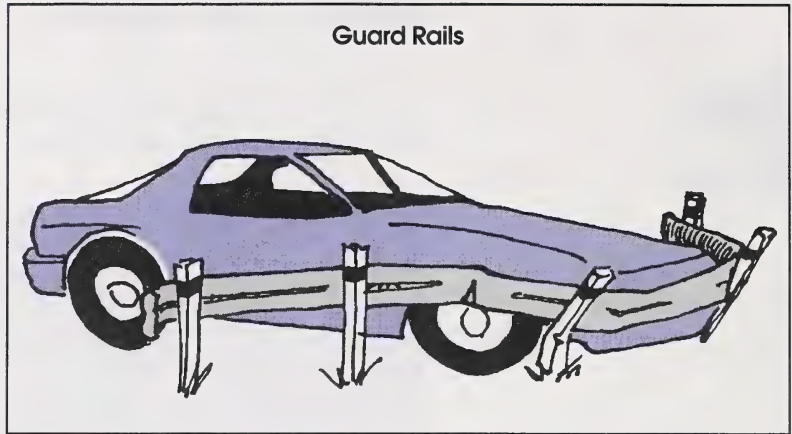


Greater demands for roadway safety increased as improvements in auto speed increased. For example, hitting a bump in the road at 10 km/h has a very different effect than hitting that same bump at 100 km/h.



Traffic engineers work to make the roadways safer to travel on. The following examples only show a few of the safety features found on roadways.

For each of the highway safety features, state what the function of these features are or how they may help save lives.

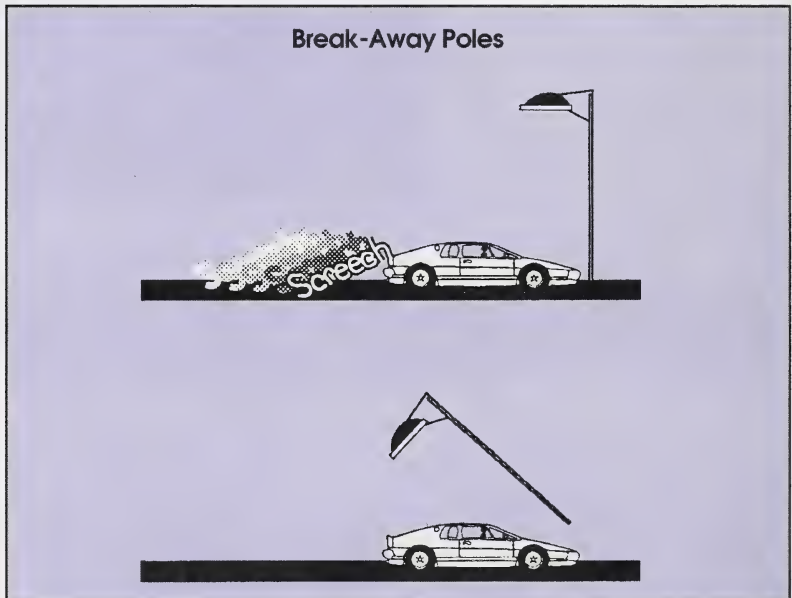


1. guard rails

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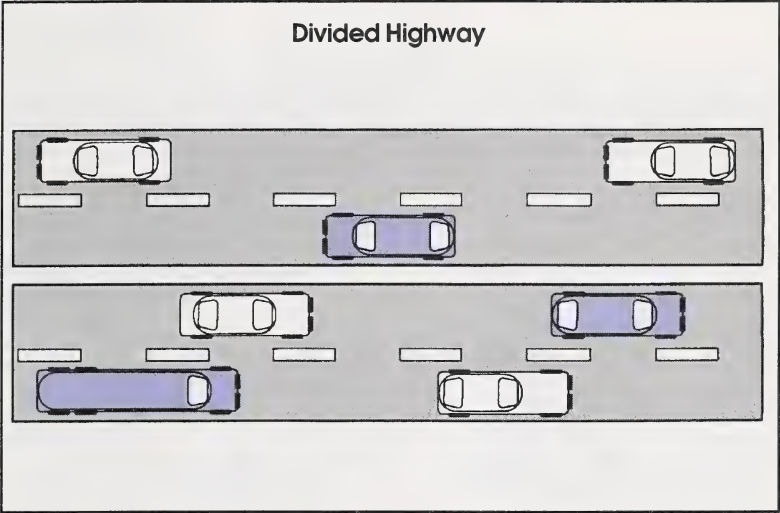


2. break-away poles

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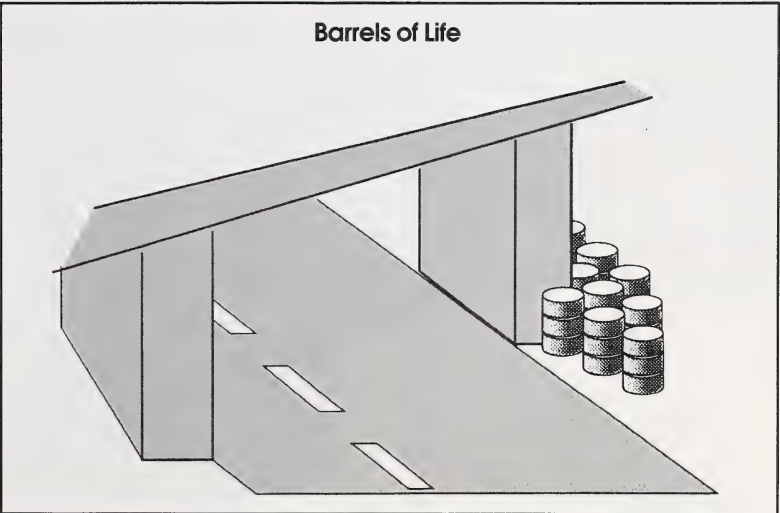
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3. divided highways

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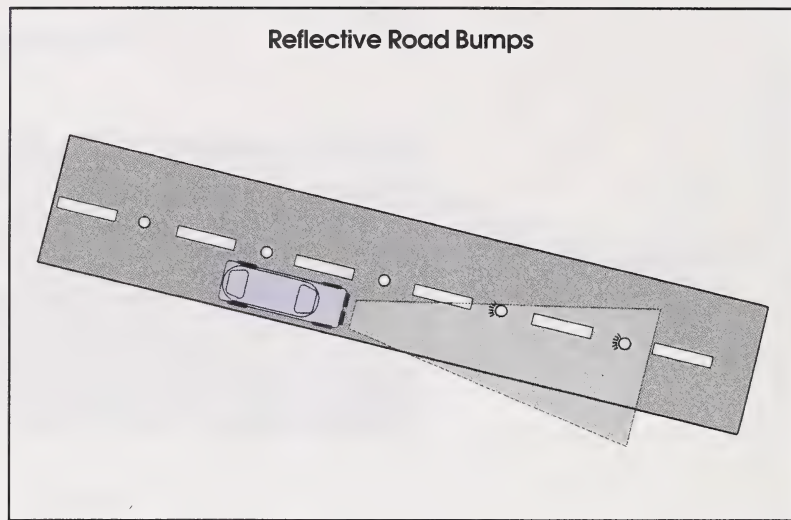


4. barrels of life

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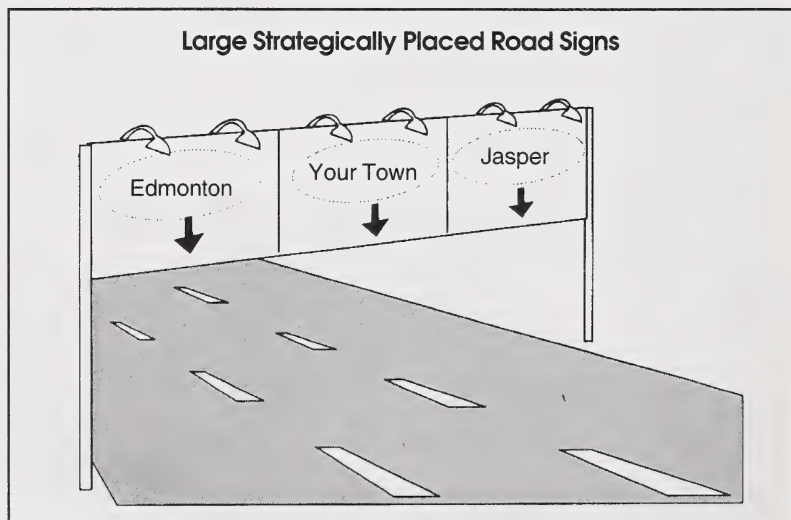




5. reflective road bumps on centre road line

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6. large, strategically placed road signs

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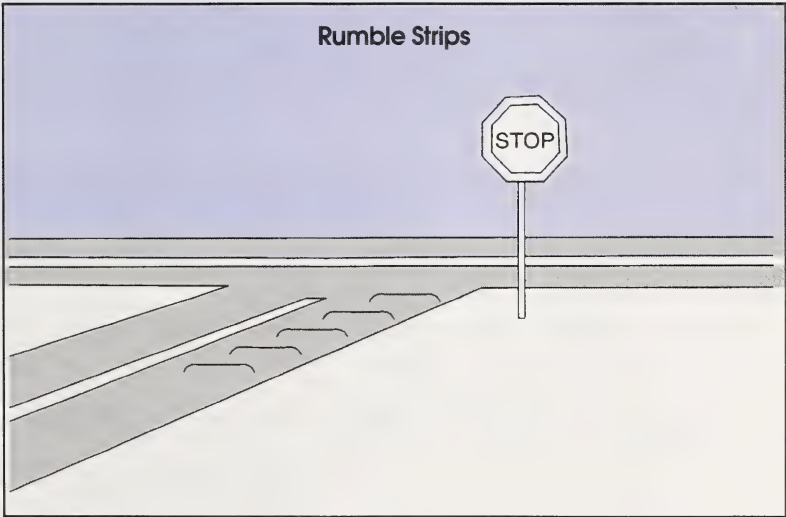
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7. overpasses

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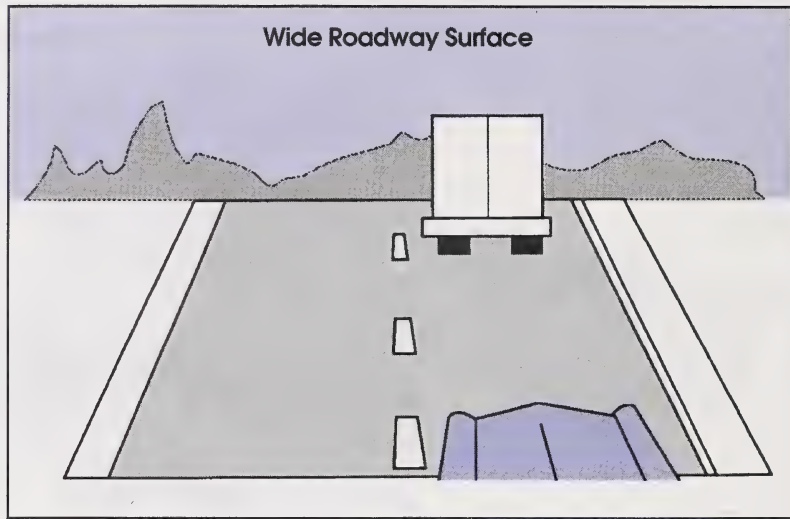
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8. rumble strips across the road before a stop sign

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9. wider roads

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Although traffic engineers work to help make the roadways safer, the human element is also very important. Properly trained and licensed drivers that obey all of the safe driving rules make the roadways safer for all.

Check your answers by turning to the Appendix, Section 2: Activity 3.

### Activity 4: Trade-offs



A race car driver is usually in a very dangerous situation while being in a very safe environment. How is this possible?

The driver's compartment shown here is the ultimate in safe packaging of a driver.



Why does the driver's compartment of a street vehicle not look exactly like that of a race car?

### Racing Car Versus Street Vehicle

You will analyse some of the safety features, in terms of comfort, convenience, and cost, shown in the following photographs.

Study the following photographs and answer the questions.



Street Vehicle



Racing Car



1. The type of seat belt in the street vehicle is a lap and shoulder belt. In the racing car, the driver is held in with a five-point racing harness. Why do you think an ordinary car is not equipped with a racing car harness?

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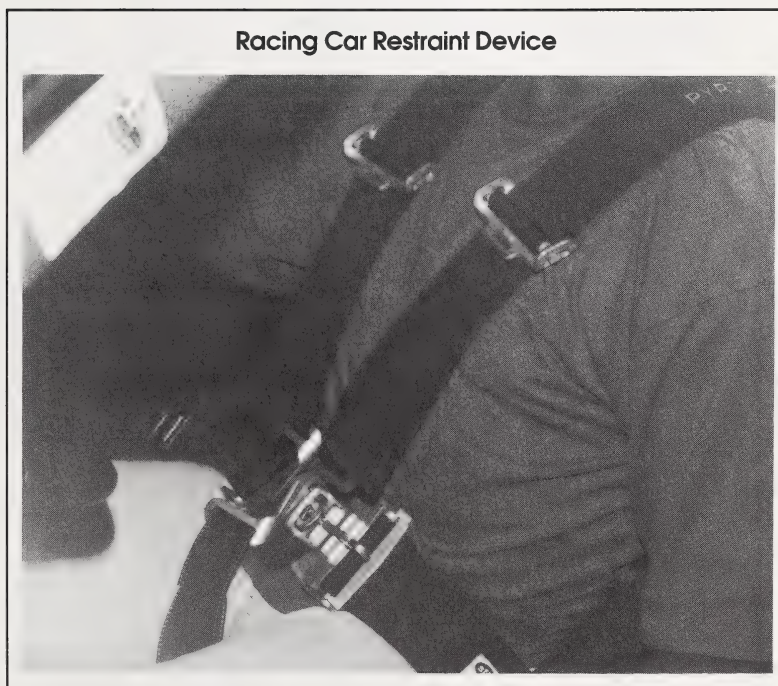


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The racing car seat shown in the following photo is very firm and the sides reach up quite high to eliminate any movement. When the driver is securely belted in, the driver does not move from the seat at all.



2. Do you think that a seat and belting system like the one shown in the previous photo would be found in everyday street cars? Explain.

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3. Keeping in mind the rising costs of automobiles, analyse which type of interior would cost more to manufacture? To answer this question, analyse the previous photos.

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4. If you had a racing car with an interior as shown in the photo, how convenient would it be to get into and take it to the corner store to buy groceries? Explain.

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This investigation should have shown you that aspects such as comfort, convenience, and cost all come into play when society and technology agree on workable solutions regarding automobile safety.

Check your answers by turning to the Appendix, Section 2: Activity 4.



## Follow-up Activities

If you had some difficulty understanding the concepts and the activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

### Extra Help

Automobile technology has advanced an incredible amount since the car first came on the scene. Cars are travelling at greater speeds and over greater distances. With these greater speeds comes a greater risk of collision and injury. Technological advances in safety features, braking and handling systems, and roadways are helping to reduce the risk of accidents and injury.

Answer the following true/false questions. Place a **T** if the statement is true and an **F** if the statement is false. If the statement is false, rewrite it to make it true.

- \_\_\_\_\_ 1. There were fewer major accidents in the early days of auto travel due to slower speeds.

\_\_\_\_\_

- \_\_\_\_\_ 2. Padded dashboards do not help reduce the risk of injury.

\_\_\_\_\_

- \_\_\_\_\_ 3. You have a greater risk of being injured in a new car than in a car 25 years old.

\_\_\_\_\_

- \_\_\_\_\_ 4. Concrete guard rails are very safe.

\_\_\_\_\_

- \_\_\_\_\_ 5. Even with all of the safety features of roads and cars, the human element is very important.

\_\_\_\_\_

Check your answers by turning to the Appendix, Section 2: Extra Help.



Enrichment

Do **one** of the following:

- 1. Survey new cars for safety features. The following chart is an example of a possible survey chart. Circle the number most accurate. You may add other features if you wish.

Which Car Is Safest?

Safety Feature

Least Safe

→

←

Most Safe

Padded interior	1	2	3	4	5
Air bags	1	2	3	4	5
Head rests	1	2	3	4	5
ABS brakes	1	2	3	4	5
Antiskid drive wheels	1	2	3	4	5
Child-proof safety locks on rear doors	1	2	3	4	5
Reinforced doorframe	1	2	3	4	5
Roll cages	1	2	3	4	5
Puncture proof gas tanks	1	2	3	4	5
Collapsing steering wheel with padded rim and hub	1	2	3	4	5
Daytime running lights	1	2	3	4	5
Recessed door handles	1	2	3	4	5

2. Survey at least ten people on the question, "Should the speed limit in Alberta be lowered?" Graph your results on a circle graph.
3. Obtain statistics from Alberta Transportation and do a report on the location of most accidents (i.e. intersections, highways, etc.).

Check your answers by turning to the Appendix, Section 2: Enrichment.

## Conclusion

As technology advances in auto construction, speeds increase as do the numbers of automobiles on the roadways. Safety concerns involving automobile construction must be addressed, and safe highways must also be built to accommodate them. The technology in all of these areas must advance at the same rate for highways to remain safe.

Assignment  
Booklet

## ASSIGNMENT

Turn to your Assignment Booklet and do the assignment for Section 2.

## MODULE SUMMARY

Safe transportation is controlled by what people do directly and also by what they build. In today's fast-paced world, technology has developed to the point where some situations have become more dangerous. Now people must develop technologies to make these situations safer.



By studying some of the safety features in vehicles today, it should be apparent that the human element must also be taken into consideration for transportation to be safe.

# Appendix

	<b>Glossary</b>
	<b>Activities</b>
	<b>Extra Help</b>
	<b>Enrichment</b>





## Glossary

**BAC**

- Blood Alcohol Concentration measured as the number of milligrams of alcohol in 100 millilitres of blood

**casualty collision**

- a vehicle collision which results in death or injury

**depressant**

- a drug that slows down of the body's functions

**drug**

- any substance that affects the body's normal function

**fatality**

- the death of a person within 30 days of a motor vehicle collision

**psychoactive**

- affecting the mind

**restraint device**

- a system such as seat belts designed to hold a person in place during collision

**technology**

- all of the inventions and techniques people have developed to solve practical problems; science at work

## Suggested Answers

### Section 1: Activity 1

1. **T** For example, 409 people were killed on Alberta roadways in 1990.
2. **F** Thirty percent of the people who die in car crashes die because they are thrown out of the vehicle.
3. **F** Motorcycle accidents are less common, but the number of fatalities are high when you compare the number of motorcycles to the number of cars.
4. **F** Very few people are killed because of burning or drowning. One study indicates that it is fewer than 0.1 percent of all vehicle accident fatalities.
5. **F** The child could get crushed by your body weight.
6. **F** You don't have enough time to react even at 50 km/h.
7. **F** Most people die within 40 kilometres of their home.
8. **T** The person could be thrown into you if the car is hit from the side or it overturns.
9. **F** Most traffic accidents occur on Friday afternoon.
10. **T** This statistic is the basis for insurance companies charging higher rates for young male drivers. Inexperience may be one contributing factor.
11. **F** July and August had the highest number of fatalities in 1989. September would also be included for 1990.
12. **F** Pedestrians accounted for only 11 percent of traffic fatalities in 1990.
13. **F** In 1990, 56.8 percent of the casualty collisions occurred on dry or good road conditions compared to 21 percent on snow and ice surfaces.
14. **T** Young females are responsible for the greatest number of accidents caused by female drivers.
15. **T** This age group is the one most likely to be involved in collisions and is most likely not to wear seat belts.
16. Tourist traffic, the number of boats and holiday trailers, long weekends, and vacation periods result in increased roadway traffic during July and August.
17. The start of a weekend traffic rush could result in increased traffic, inattention, and careless driving.

18. Young drivers have less driving experience. They could also be more inclined to consider driving as a recreational activity rather than means of transportation, take unnecessary chances, experiment with alcohol, and misjudge environmental road conditions or the actions of other drivers.
19. Drivers could become impatient as they come closer to home, underestimate unexpected hazards in familiar surroundings or roadways, become more careless by considering the trip to be nearly over, and worst of all fall victim to fatigue.
20. Drivers are more cautious and tend to make necessary adjustments on poor road conditions. They could become overly careless on good road conditions by underestimating speed, stopping distance, and reaction time.
21. Answers may vary but could refer to statistics used by
  - insurance companies to establish rates and premiums
  - automobile manufacturers to improve and assess safety features and design
  - engineers to design safer highways, improve traffic flow on roadways, and modify high-collision risk areas
  - politicians to establish laws, regulations, and standards aimed at increasing public safety and reducing accident statistics
  - police and law enforcement groups to protect public interests by identifying dangerous drivers
  - awareness groups to educate people about transportation safety, risks, and solutions
22.
  - a. The highest number of collisions occurred in 1989.
  - b. The highest number of fatalities occurred in 1986.
  - c. Answers will vary, but the most likely explanations would be that technology has improved safety equipment, more people are wearing the equipment such as seat belts, and roadways have become safer through better design.
23.
  - a. Drivers were the largest group killed.
  - b. The data does not take into account the numbers of cars versus the number of motorcycles on the road.
  - c. Yes, helmets protect the heads of people who wear them, and therefore, head injuries should decrease.



24. a. The majority of motorcycle casualty collisions involve male drivers between the ages of 18 and 44 years of age. The highest rate of accidents occurs for drivers between 16 and 19 years of age.
- b. The groups least likely to be involved in motorcycle casualty collisions are those 55 years of age and over and female drivers.
- c. To make valid comparisons, it would be necessary to take into account an equal number of motorcyclists as well as the numbers of kilometres driven by each age and sex group of motorcycle operators.
25. a. Females had a lower collision rate for all age groups.
- b. A possible answer could be with the stereotype that the male is the driver if both a male and a female are in the car. This stereotype is being changed, and perhaps statistics in the future will also change. Another possible answer is that females are better drivers.
- c. You would charge the male group between the ages of 18 and 19 because they have the highest collision rates and are the higher risk group.
- d. Probably the most logical explanation has to do with experience. Young drivers are learning and developing driving habits and skills.
26. a. The highest rate of collisions occurs on Friday.
- b. The most dangerous time of day was between 3:00 p.m. and 6:59 p.m. The most likely explanation is that there are more cars on the road at this time due to most people travelling home after work, commonly known as rush hour.
27. No, poor road conditions cannot be blamed for the majority of accidents in Alberta. Statistics show that 59.7 percent of fatal collisions and 56.7 percent of injury collisions occurred when surface conditions were dry compared with 19.6 percent of fatal accidents and 21.1 percent of injury collisions when snow and ice conditions were involved.
28. A possible explanation could be due to reduced control of an automobile by an impaired driver. An impaired driver may not act in a responsible manner before, during, and after the accident, therefore, making it a riskier situation.

### Section 1: Activity 2

1. a. The BAC for the female is  $203 - 45 = 158$  mg% or 0.158.
- b. It will take about 13.5 hours for the alcohol to be totally eliminated, based on a reading of 203 mg% divided by 15 mg% of elimination per hour.

- c. The reading must drop from 203 mg% to 80 mg%, a difference of 123. When divided by 15 mg% of elimination per hour, it would take about 8.2 hours to reach 80 mg% or a 0.08 reading.
2. a. No, the male will not be charged because his BAC is about 45 mg% or about a 0.045 reading.  
b. It will take about 3 h to completely eliminate the alcohol.
3. The answers will vary depending on your sex and body weight. For example, a 0.08 reading for a 79 kg male would be reached when four drinks are consumed in less than an hour. A 57 kg female will reach 0.08 after three drinks in less than an hour.
4. According to the graph, a 19 year old has almost twice the risk of fatality at 80 mg% as a 25 year old.
5. There are two main factors why the risk is so high for 16 to 19 year olds:  
  
The first factor is that people 16 to 19 years old are still learning their driving skills.  
  
The second factor is the lack of experience and large amount of experimentation with alcohol at ages 16 to 19.
6. a. Alcohol causes vision to become blurred or turn into double vision.  
b. People with blurred vision tend to fixate and not scan the road as often. This reduces how well a person can drive and places everybody at greater risk.
7. If you had to slam on the brakes to avoid a crash, the extra time required to react could make the crash unavoidable if reaction time was slowed.
8. Your answer will vary depending on personal preference. Any argument relating to the figures shown is valid for your opinion.

### Section 1: Activity 3

1. a. **F** A medical examination is required for a Class 1, 2, and 4 licence. All other classes only require one for the initial application.  
b. **T**  
c. **F** A Class 2 licence is required to operate a city transit bus.  
d. **F** A Class 4 licence is required to operate a taxi or ambulance.  
e. **T**  
f. **F** Helmets are required for a Class 6 licence.

- g. **T**
  - h. **T**
  - i. **F** A Class 2 or 4 licence is required to drive a school bus.
  - j. **F** A Class 5 licence would be required by a 16 year old to drive a car unaccompanied.
- 2. a. A learner's permit requires a Class 7 licence.
  - b. Unaccompanied car drivers require a Class 5 licence.
  - c. Farm tractor operators are unlicensed.
  - d. Recreational vehicle drivers require a Class 5 licence.
  - e. A Class 1 licence permits a person to drive all vehicles except a motorcycle.
  - f. A Class 2 or 4 licence is required to drive a kindergarten bus.
- 3. The drivers of vehicles in Classes 1, 2, and 4 are required to have medical examinations because they are either transporting passengers for hire (Class 2 and 4) or operating large, potentially dangerous vehicles (Class 1 and 2).
  - 4. Vision tests are mandatory for all classes. Monitoring vision of all drivers is very important when dealing with safe transportation.

## Section 1: Follow-up Activities

### Extra Help

- 1. **F** It is safer to stay inside the vehicle.
- 2. **F** There are fewer motorcycles on the road; therefore, there are fewer accidents but the fatality rate is higher.
- 3. **T** There are more drivers killed than there are passengers.
- 4. **F** Males have a higher collision rate.
- 5. **T** The least number of accidents occur on Sundays.
- 6. **T** Rush-hour traffic has the highest frequency of accidents.
- 7. **F** Most accidents took place on dry pavement.

8. **F** Injuries and deaths are reduced when seat belts are worn.
9. **F** Alcohol is a depressant; it slows down your brain activity.
10. **T** The minimum penalty for a first conviction is \$300.00.  
The courts can place any amount of fine over the minimum.

### Enrichment

Answers will vary depending on the availability and use of resources.

### Section 2: Activity 1

1. Your answers will vary, but could include some or all of the following reasons:
  - Cars were not beyond most people's budgets.
  - Cars provided greater freedom of movement.
  - Cars were not too complicated to operate.
  - Cars are a convenient form of transportation.
  - Mass production reduced costs.
2.
  - a. Padded dashboards and visors absorb some collision energy and reduce injury.
  - b. Energy-absorbing steering column will collapse instead of impaling the driver when the front of the car smashes into an object.
  - c. Reinforced door beams help protect you from an object such as a car smashing through the door and crushing you in your seat.
  - d. Safety windshields reduce injuries from shattered glass because they break into rectangular pieces rather than sharp, long shards. They also keep their shape and can prevent you from going through the windshield.
  - e. Safety belts help reduce the second collision.
3. Some other safety features that could be incorporated into the design of your car include
  - energy-absorbing bumpers to help absorb kinetic energy
  - headrests to prevent whiplash
  - airbags to stop you from hitting the dashboard or steering column
  - puncture-proof gas tank
  - ABS brakes
  - roll bars incorporated into the frame
  - flat-resistant tires

## Section 2: Activity 2

1. Restraints should be worn by all car occupants because they
  - reduce the second collisions with the vehicle or each other
  - prevent occupants from being thrown out of the vehicle
  - increase the chances for surviving during collision
2. If there is an accident, an infant or child sitting on the lap of an adult would not be protected during a crash if both are belted in together. In fact, the child would likely be crushed against the seat belt during collision. As a general rule, children should always ride in the rear seat with properly installed child restraints.
3.
  - a. Yes, seat belts work. The percentage of people killed who were not belted in was 73.1 percent.
  - b. Drivers 16 to 19 years of age are most likely to have an accident; therefore, if they are not restrained they are in a very high risk category.
4.
  - a. Being thrown free is twenty-five times more dangerous. In almost any collision, it is far safer to remain inside the vehicle than to be thrown to the pavement, or into the path of other vehicles.
  - b. There isn't any way your arms and legs can brace you in a collision. The force of impact at just 15 km/h is equivalent to catching a 90 kg bag of cement from a first story window.
  - c. You have a great chance of being in a collision. Everyone can expect to be in a crash once every 10 years. For one out of twenty people, it will be a serious crash. For one out of sixty people, it will be fatal.
  - d. Injuries caused by seatbelts are minor if they occur. Slight bruising or stiffness may result in a serious crash.
  - e. No matter how good a driver you are or how quick you are, you cannot control the actions of others on the road.
  - f. Collisions involving submersion or fire are extremely rare. Less than one-half of one percent of all collisions involve these circumstances. If fire or submersion is a factor, you could free yourself if you have a seat belt on. If you did not wear your seat belt, you could be knocked unconscious and suffer the consequences of the fire or submersion.
  - g. Seat belts in today's automobiles are designed for comfort and safety. Under normal use they allow you freedom to move, but during a sudden stop they will lock to keep you in place.
  - h. Eight percent of deaths and injuries occur in cars travelling less than 60 km/h. Seventy-five percent of injuries and deaths occur less than 40 km from the homes of the people involved.



## Section 2: Activity 3

1. Guard rails absorb kinetic energy and reduce the chances of the vehicle going over a cliff, into oncoming traffic, or into a dangerous obstacle. They are also made to keep the vehicle to one side rather than veering it out into oncoming traffic.
2. Break-away poles snap off above the base and allow the car to carry on through rather than come to a sudden stop.
3. Divided highways are safer in that all the traffic is going in the same direction, therefore reducing the risk of a head-on collision.
4. Barrels of life absorb the kinetic energy of a moving car and gradually slow it down, as opposed to hitting a large pillar that doesn't move.
5. Since the bumps reflect light, they are easily seen and indicate the sides of the lane. They also make a noise when the tires pass over them so the driver is alerted by a loud noise to the fact that the car is moving out of its lane.
6. Large, strategically placed road signs will allow a driver to concentrate on driving and searching the area for road signs.
7. Overpasses help to keep traffic from entering or leaving a road in a dangerous situation. Most overpasses have ramps for drivers to either slow down or to accelerate safely to merge with existing traffic.
8. The sound of the tires hitting the bumps warns the driver of a stop sign ahead.
9. Wider roads provide more room to manoeuvre, pass, and pull over for emergencies.

## Section 2: Activity 4

1. The lap-shoulder belt system is easy to fasten and does a very good job of protecting a person. The racing harness is awkward to put on and to fasten securely. The five-point racing harness restricts movement and is not very comfortable. The inconvenience involved with the racing harness is probably the main reason why it is not found in street cars.
2. No. For everyday driving and activities, this seat and system would be very uncomfortable. To turn on the radio, open the glove box, or adjust the heater or air conditioner would be an impossible feat. A system such as the one shown is designed for a very specific use and ones found in street cars are modified to meet everyday requirements.
3. The interior of the race car would be more expensive.
4. A short drive to the corner store would be very inconvenient. Climbing over the reinforcing bars and buckling into the harness would take far too much time. Many cars today do have reinforced doors, but these beams are hidden inside the door itself for convenience.

## Section 2: Follow-up Activities

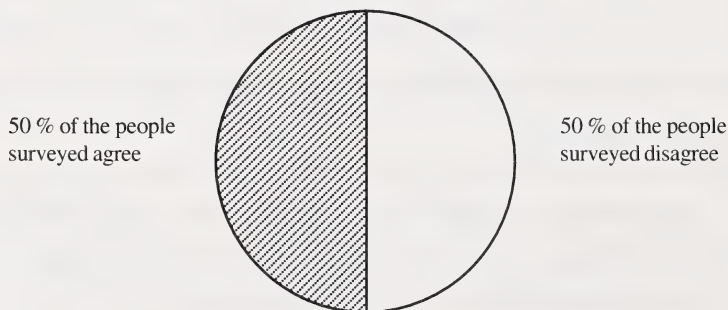
### Extra Help

1. **T**
2. **F** Padded interiors of cars help make the second collision less severe.
3. **F** Newer cars have the latest improvements in safety technology.
4. **F** Concrete guard rails that don't absorb the kinetic energy of a car can throw the car back into the flow of traffic. The concrete is an immovable object which can cause serious damage. Guard rails that absorb the car's energy will keep the car against the guard rail and slow the car down.
5. **T** Properly trained and licensed drivers are the key element.

### Enrichment

1. Your survey data and rating scale could be organized similar to the one shown. Your results will vary depending on the makes and models of cars.
2. If five people agree to lowered limits and five people disagree, your circle graph should look similar to the following graph. Other survey results would have a different circle graph.

**Should The Speed Limit be Lowered in Alberta?**



3. Answers will vary depending on which year the traffic collision statistics are based on. Studies have shown that intersection-related collisions have the largest number of accidents but non-intersection locations should also be included in your report.

## **NOTES**

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